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EDITORIAL NOTES

PUBLIC SERVICE

IN last week's "JOURNAL" we commented on the preparations made over a long period by gas undertakings throughout the country for ensuring as far as possible continuity of gas manufacture in the event of enemy bombing finding its target on gas-works and in rendering their distribution systems flexible under severe damage, as safe as possible in the event of fractured mains and services, and also quickly remediable. The smoothness and efficiency—and, we would add, coolness—with which the various squads of A.R.P. personnel carry on with repair jobs under the most difficult and harassing conditions are, to say the least, gratifying. And we said, too, in the "JOURNAL" last week that could the general public have an insight into the determined and courageous way in which gas undertakings affected are working under conditions the reverse of pleasant they would be loud in their praise of the manner in which "business as usual"—or at any rate approaching normal—is being made possible.

Since then the world has had an account of the removal of the time bomb from the precincts of St. Paul's Cathedral—a very gallant action successfully undertaken with complete disregard of personal danger, an action which alone could save this world-famous building. In this grand piece of work the distribution men of the Gas Light and Coke Company played an important and a splendid part. Their share in the work was, we are glad to say, recorded in an article in *The Times* of Sept. 18, and we feel that the story should be placed on record also in the columns of the "JOURNAL." At one time the crater made by the large time bomb was licked by flames of gas issuing from a fractured main. This, and a second fire which broke out later nearby were extinguished by workers of the Gas Company, who, as the writer of *The Times*' article remarked, toiled with the same disregard of danger as was shown by the men of the Royal Engineers who finally removed the bomb. They got through in an hour or two work which normally, taking all the usual precautions, would have occupied two days. The fact that these men dealt so swiftly and skilfully with the fires on a job of work where the time factor was all-important enabled the soldiers to remove the bomb, which could be then taken to a place, as it fortunately happened, where it could be exploded in comparative safety. For more than 12 hours, relieving each other from time to time, 10 or 12 gas distribution men were working around a crater in which there was a ton of high explosive.

This is the type of action for which the A.R.P. personnel of the Gas Industry is prepared. That in this particular instance it happened that men of a particular gas undertaking should be called upon to share in a peculiarly hazardous venture is beside the point. The major consideration underlying this note is that of our comment last week—the preparedness of the Gas Industry in the interests of public safety and public welfare and convenience, and the steadiness, courage, and determination of the men undertaking tasks which as yet, perhaps, have not to a sufficient degree fired the public imagination. After all, in peacetime, continuity of gas supply was taken for granted, the supply of gas—erroneously enough even at that time—regarded as a prosaic affair. Nor is this note intended to mean that the Gas Industry in the present strenuous circumstances is doing any more than any other public utility would do and is doing willingly. It is, however, salutary to reflect on the risks which civil workers, as well as members of the Services, are taking so cheerfully and to such enormously good effect. The spirit animating the men who worked around St. Paul's Cathedral, whose deeds have rightly been made known, is that which inspires those who may be called upon to try to preserve a humble Parish Church.

Behind the men who acted so gallantly, as far as gas is concerned, in the particular instance to which reference is made here, rests the organization. Again as far as gas is concerned, the Metropolis, with its vast and intricate system of mains and its concentrated yet varied load, presents peculiar problems. But through the "preparedness" of which we have spoken, complexity has, by well worked out plan, been resolved into smooth-operating simplicity. Maintenance of this simplicity does, of course, demand constant and skilled vigilance. We have been able from time to time, in peacetime and since September of 1939, to become thoroughly acquainted with the A.R.P. organization of the Gas Light and Coke Company, and we have visited the headquarters from which the battle against damaged gas mains is directed. We could say much about this admirable organization. Prudence, however, at this stage forbids.

THE NORTH BRITISH MEETING

IT will have been gathered from our report in last week's "JOURNAL"—it extended over seven columns—that the meeting of the North British Association of Gas Managers, held in Edinburgh on Sept. 6, was highly successful. We are sure that the meeting served a very useful purpose indeed, and the large attendance exemplified the quiet confidence and determination of gas engineers and managers to carry on as far as possible normally in circumstances the reverse of normal.

QUARTERLY INDEX

We propose to issue the July—September Index only to those who require it and not to incorporate a copy in every "JOURNAL" as is done in more normal times. Obviously any of these which might be superfluous would entail unjustifiable paper consumption. We should be glad if those subscribers who wish to receive a copy would please notify us not later than Sept. 30. We shall keep a record of those who apply so that there will be no need for them to make application for subsequent quarters. We feel sure that we shall receive willing co-operation from our readers in this important matter of paper conservation.

Naturally added responsibilities and exacting duties prevented some of the members being present; nevertheless, it was a notable wartime gathering under the Presidency of Mr. H. A. Aitken, of Buckhaven and Leven. The two Papers presented at the meeting—one by Mr. A. B. Munro, of Edinburgh, on "Observations on Policy"; the other, by Mr. J. M. Dow, of Kirkcaldy, on oxide purification under wartime conditions—were published *in extenso* in the "JOURNAL" of Sept. 11, and both met with an excellent discussion. Mr. Munro's Paper included an explanation of the Edinburgh Gas Department's wartime selling policy in regard to appliances, and the Author's suggestion that a regional committee should be established to investigate the subject of standardization of appliance prices was endorsed by more than one speaker in the discussion, as also was his contention that little risk attached to modified hire-purchase terms even in the circumstances of to-day, while stress was laid, quite rightly, on the need for setting-up training centres for fitters on a co-operative basis more widespread than obtains to-day. Good fitting work at any time is most important in the interests of efficiency and appearance and also safety. To-day skilled fitters capable of working surely and swiftly, and without a great deal of supervision, are needed more than ever if the Gas Industry is to maintain the goodwill of the consumer and its reputation for a high standard of service which it built up soundly in pre-war years.

Mr. Dow's Paper dealt with a problem which must be exercising the minds of all gas engineers nowadays—how best to utilize the oxides they possess for gas purification, how best to conserve their activity and capacity over prolonged periods, and the possibilities of employing substitutes for natural bog ore. It is, of course, incumbent upon gas engineers to give their attention to the most efficient use of the material at present available and to possible alternatives to natural oxides for gas purification. Fortunately, during recent years much investigation and experiment has been conducted both into making the best use of oxide purification plants and into alternative methods of ridding gas of sulphuretted hydrogen. Mr. Dow referred to the production by the aluminium industry of a waste by-product—red mud, rich in iron oxide, having relative chemical similarity to established oxides used for purification. Due, however, to the presence of aluminium silicate—which appears to enshroud the particles of the material in a covering of "water glass"—this by-product proved inactive as far as the removal of hydrogen sulphide is concerned. Steps have been taken, though, to liberate the oxide by washing the material with sulphurous acid, and this method, we understand, has met with a considerable measure of success. The cost of the washing naturally adds to the price of the product, but this consideration cannot have the same weight in wartime as in peacetime. It would appear that the product is one of much promise and its efficient treatment for sulphuretted hydrogen removal one for immediate investigation.

Mention was made during the discussion of liquid processes for sulphur removal from gas. For economic and other reasons, such as technical supervision of plant and so on, and more especially because of the necessity of removing all the sulphuretted hydrogen from gas supplied to the district, liquid processes have not replaced in the Gas Industry the well-tried dry purification method by oxide. There are, however, various processes based on ammonia washing which, as far as the Gas Industry is concerned, would seem to be very well adapted to a partial removal of sulphuretted hydrogen, leaving final purification to existing oxide boxes. Then there are other methods of sulphur recovery based on higher working temperatures and catalysis. It should not, we think, prove difficult to find an answer to possible future purification problems.

Gas for Motor Transport

The British Commercial Gas Association recently circulated to 804 gas undertakings in Great Britain a questionnaire asking for certain information in regard to gas filling stations in their areas of supply. There was approximately a 50% response—not too bad, considering conditions as they are, yet not good enough when it is so desirable that a national list giving a true picture of the situation should be prepared. It is to be hoped that in the general interest those undertakings which for one reason or another have not yet replied to the questionnaire will do so at the earliest possible moment. Of the 405 replies received up to a week or so ago, 215 gas undertakings intimated that they were in a position to offer gas for motor transport purposes—*i.e.*, gas at ordinary mains pressure. A further 72 would be prepared to make arrangements "should the demand arise." In this regard we think that gas undertakings generally owe it to the public and motor transport concerns to inform them of what gas can do to replace petrol and of its advantages and limitations, and make known their willingness to assist motor users to the best of their ability. A further point which should be settled—it is to our mind a most important point—is standardization of the price of gas sold for the purpose. A gas bag is, according to size, capable of containing so many cubic feet of gas, and an amount of useful energy depending on the number of B.Th.U. per cu.ft. of gas at any particular filling station. In spite of variance in calorific value, however, some workable compromise, without too fine a nicety, should be capable of being drawn up.

A Long Pull and a Strong Pull

Certain foundations of a carbonizing plant had been removed by "enemy action," and its balance appeared somewhat precarious. But still it stood upright, much to the amazement of the onlookers who had gathered to view the damage. Somebody ventured to ask aloud what on earth was keeping the building in its vertical position, but the works foreman who was standing by was quite equal to the occasion. "Why," he said, "it's the suction in the collecting main of course."

Tribute

A reader in the South-East of England sends us the following anecdote:

My wife, having taken the kiddies to school, was returning in her little "Ford," when she was hailed by two R.A.F. pilots who were travelling on foot in the same direction. She picked them up, apologizing for the dirty state of the "bus," which is used frequently for carrying rabbit and chicken food.

On the way to the village my wife endeavoured to learn something of their experiences but, beyond admitting that they had been in a scrap or two, they were not to be "drawn." As the car approached the village, the air raid warning was sounded and, of course, wardens immediately appeared in the street.

To my wife's amazement one pilot turned to the other and said, quite seriously: "You know, George, I think these wardens are marvellous; they are on duty directly there is a warning They lose their sleep at nights and they get on with their ordinary work during the day as though nothing had happened. I take my hat off to them; I think they are great!"

Forthcoming Engagements

Sept.

26.—Wales and Mon. Association.—General Meeting at Cardiff, 11 a.m.

28.—Manchester and District Junior Association.—Annual General Meeting, Engineers' Club, Manchester, 2 p.m.

Oct.

7.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

8.—I.G.E.—Council, 10 a.m.

9.—I.G.E.—Board of Examiners, 2 p.m.

15.—I.G.E.—Gas Education Executive Committee, 2 p.m.

North British Association Golf Circle

In connexion with the Meeting in Edinburgh on Sept. 6 of the North British Association, an outing of the Golf Circle was held at Baberton. The results were as follows:

Prize Winners

				Score.
Section I (Handicaps up to and including 12):				
	1st H'cap.,	R. B. Waddell, Polmont ...	...	80 less 6—74
Tie	2nd „	G. A. Mitchell, Glasgow ...	...	84 „ 10—74
	3rd „	T. F. Scott, Girvan ...	...	86 „ 12—74
Tie	4th „	H. Rule, Stirling	...	80 „ 5—75
		J. H. MacKellar, Glasgow	...	82 „ 7—75
Section II (Handicaps over 12):				
	1st H'cap.,	J. M. Dow, Kirkcaldy ...	...	90 „ 18—72
Tie	2nd „	W. Kirk, Motherwell ...	...	90 „ 18—72
	3rd „	S. Smith, Paisley	...	89 „ 16—73
Tie	4th „	J. D. Couper, Glasgow ...	...	88 „ 13—75
		R. A. MacLaren, Newton-on-Ayre		93 „ 18—75

The sum of £8 was collected on behalf of the Lord Provost's Red Cross Fund.

Personal

Sir FREDERICK J. WEST has accepted the position of Chairman of the (North-Western) Area Board under the scheme announced recently by Mr. Harold Macmillan, Parliamentary Secretary of the Ministry of Supply and Chairman of the Industrial Capacity Committee.

The duties of the Area Boards comprise the utilization of their knowledge of local industry to ensure that the manufacturing capacity of each area is fully employed both in the war effort and in export trade, particularly the linking up of the smaller engineering works as sub-contractors to the larger main contractors, and the co-ordination of all the work in the district to meet the requirements of the Admiralty, the Ministry of Aircraft Production and the Ministry of Supply, as well as the organization of measures to deal with the repair of damage from enemy action.

Sir Frederick's work in connexion with the Manchester Armaments Output Committee in the 1914-18 war, as well as his long connexion with the Engineering Employers' Federation and that of the Exporting Industries of the North-West, arising out of his Chairmanship of the Manchester Ship Canal Company, render him particularly well fitted for this position.

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Mr. N. B. THOMPSON, who has been Engineer and Manager of the Ormskirk Gas Company since May, 1936, is leaving to take up the appointment of Engineer, Manager, and Secretary to the North Cheshire and District Gas Company, a constituent company of the United Kingdom Gas Corporation, Ltd. Mr. Thompson was a founder member of the Skipton Rotary Club during the time he was Engineer and Manager of the Skipton U.D.C. Gas Department before going to Ormskirk. He is also a founder member of the Ormskirk Rotary Club, and has been a member of the Ormskirk Cricket Club, the British Legion (Ormskirk branch), the Agricultural Club, and Secretary of the Ormskirk General Hospital Men's Guild. He expects to take up his new duties early next month.

Mr. Thompson's successor at Ormskirk is Mr. D. J. COLVIN, Engineer, Manager, and Secretary of the Littleborough Gas Company.

* * *

Mr. W. LINDSAY BURNS, Managing Director of Messrs. Henry Balfour & Co., Ltd., Gas Engineers, of Leven, has been appointed a member of the Kirkcaldy Reconstruction Panel—one of five such local panels set up in Scotland by the Ministry of Aircraft Production to organize in advance the resources of establishments for the assistance of any works which have been damaged by enemy action, and to assist in restoring production with the minimum of delay.

* * *

The position to which Mr. A. C. REA, of Perth, has been appointed at Bath is that of Assistant Engineer and Manager—not Engineer and Manager as indicated in our personal column last week.

British Standard Specification

Portland Cement

A new edition of the British Standard specification for Portland Cement (B.S., 12/1940) has just been issued. There are two major features of the revision. One is the amplification of the specification to include cement of the rapid-hardening type for which there has so far not been a specification. The other is the replacement of the test for determining the tensile strength of a standard briquette by a compression test on a cement-sand mortar cube. The desirability of making this change was mentioned in the foreword to the 1931 edition. Since that date the compression test has been the subject of a further investigation, both at the Building Research Station and also by a panel of experts. It has been found to give results with different gauges more consistent than those obtained by the tensile test, while another advantage is that the strength of the mortar cubes can be related to that of concrete made with the same cement. The cement mortar cubes are compacted in a specially designed vibration machine, which is illustrated by a photograph and fully dimensioned drawings.

As it is appreciated that the adoption of the new test will require the installation of the appropriate testing apparatus, the tensile test has been retained for use when specially required.

It was considered desirable for the Specification for High Alumina Cement (B.S. 915) to form the subject of a separate document and that it should not be embodied in B.S. 12. The above standard has accordingly been issued. The general form of the specification follows the same lines as B.S. 12, but in this case, as there was no traditional tensile test, the compression test has been included without the alternative of a tensile test.

Copies of these British Standards can be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, S.W.1, price 2s. 3d., post free.

Every Member of the staff and workmen in the Kendal Gas and Water Department is in the Home Guard. The Assistant Engineer and Manager, Mr. R. P. Davison, is Company Commander

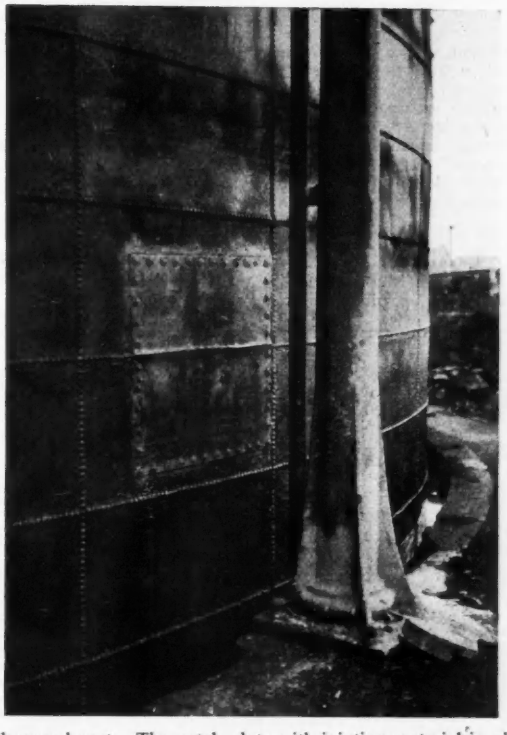
Star-Light Lamps are to be fitted experimentally by the North Cheshire and District Gas Company in main roads in the borough of Dukinfield.

The Copper Development Association has now removed its Offices, formerly in Thames House, to Grand Buildings, Trafalgar Square, London, W.C.2. Telephone : Abbey 2677.

Although the Minister of Home Security recently said in the House of Commons that it was not possible to allow modified street lighting in the Tyneside area, there are still hopes that some sort of lighting will be permitted. A conference of Tyneside local authorities passed a resolution a few weeks ago urging that street lighting be allowed to provide greater safety in the blackout, and Ald. D. Adams, M.P., who attended the conference, has received a letter in reply from the Minister of Home Security. While it was not possible at present to allow street lighting in the coastal areas, the matter would be kept under review, states the letter, and there would be no delay in extending the area where lighting was permitted as soon as circumstances allowed. Ald. Adams states that following Mr. Churchill's hint of a "brighter blackout," he still believes Tyneside will be allowed street lighting. A new system of remote control was being considered, stated Ald. Adams.

Repairing Holder Damage

The accompanying photograph is of a corrugated patch plate $\frac{3}{16}$ in. by 3 ft. square fixed on the side of a gasholder in a South-East Coast town. The damage was caused by a H.E. bomb which exploded some distance from the holder and sent a large piece of concrete through the side sheet, making a hole 18 in. by 12 in., also a slit several inches each way of the large hole. The patch plate had to be fixed in place while the hole in the side sheet was under water. Therefore, to hold the patch plate in position and to prevent the gas leaking a flat iron bar 4 in. wide and 4 ft. 8 in. long with a $\frac{1}{4}$ in. hole drilled and tapped in the centre and fitted with a $\frac{1}{4}$ in. set screw 8 in. long was passed through the hole in the side sheet and suspended with a wire lash which had previously been passed inside the holder through a rivet hole in the ring above



the damaged part. The patch plate with jointing material in place was then lowered into the water and fixed over the $\frac{1}{4}$ in. set screw. A grummet with washer and nut was then screwed up on the set screw pulling the patch plate in place. The holder was then inflated to enable the patch bolt holes to be drilled, and split bolts were fixed making a gastight joint all round. The photograph shows the completed work, which is very satisfactory.

In another part of the town the 4 in. gas main had been destroyed for a length of 24 ft. The place was excavated and both ends were temporary plugged off with wood plugs. The main was then drilled and tapped for gas bags to be inserted, enabling the new lengths of main to be fixed. The main at this point had 2 ft. 9 in. cover.

Some weeks previously gas bag holes had been drilled in the main at various points on the district to enable bags to be quickly fixed should any damage be caused to the mains.

Compressed Oil Gas in Place of Coal Gas

[A Contribution from the London, Midland and Scottish Railway Company]

The London, Midland and Scottish Railway Company has arranged for a rapid changeover to oil gas at any premises where the supply of coal gas may be temporarily cut off. The oil gas, which is manufactured by the Company mainly for dining car cookers, is compressed to approximately 150 lb./sq.in. and is distributed through high-pressure steel piping or travelling tanks. The calorific value varies between 1,150 and 1,175 B.Th.U./cu.ft. Where the high pressure oil gas steel piping is in the vicinity of the coal gas main, a tee piece with valve is fitted to the former piping and connected to high-pressure governors, the outlet of which is connected to the coal gas main. A main cock is fitted to allow rapid conversion to oil gas.

The pressure of oil gas is reduced in two stages—*i.e.*, the main governor reduces the pressure from 150 lb./sq.in. to 6 in. w.g. and the second governor reduces to the working pressure. A ½ in. spring loaded relief valve is fitted between the two governors to allow the gas to escape to atmosphere in the event of any banking of pressure on the outlet side of the main governor.

Where there is no oil gas main near the coal gas supply, a travelling tank wagon of oil gas is positioned at the most convenient point and connexions and governors installed in a similar manner, utilizing the flexible filling pipe attached to the tank now used for filling the gas cylinders of dining cars.

Before turning on the oil gas, the valves or main cocks on the inlet and outlet side of the primary and secondary gas meters are closed and all lamps, burners, pilot-lights, and other appliances are shut off. The oil gas is then turned on and the appliances adjusted for the new calorific value. That is, the air adjuster on the lamps and burners are fully opened, and the gas adjuster is manipulated till the maximum candle power is obtained. Other gas appliances such as cookers, fires, and boilers, can be adjusted for the higher calorific value in a similar manner.

The size of an oil gas flame is smaller than a coal gas flame. It is therefore desirable to change the mantles to get the best use out of the oil gas, but the flame will nearly fill a No. 1 mantle and even with a No. 2 mantle 50% illumination can be obtained.

As regards the nozzle sizes, a No. 2 size nozzle can be easily adjusted for oil gas and a No. 1 size nozzle can also be made to function satisfactorily. There is therefore no need to change the nozzles.

The arrangements have been carried out by Mr. G. Tomlinson on behalf of Mr. W. K. Wallace, the Chief Civil Engineer of the London, Midland and Scottish Railway Company, with the co-operation of Mr. W. A. Stanier, the Chief Mechanical Engineer.

A Gas-Fired Travelling Oven of a consumption of 3,000 cu.ft. per hour has been installed by the Hamilton Co-operative Baking Society.

WHO WASTES WASTE PAPER—HELPS THE ENEMY
WRAPPING PAPER, CARDBOARD BOXES, NEWSPAPERS, ETC.
DUMP YOUR WASTE PAPER HERE
LET ME LIGHT YOUR FIRES
SAVE WASTE PAPER
THE POKER BURNER
SAVES PAPER & WOOD

This ingenious display, linking up the use of the gas poker with the waste paper salvage campaign, was arranged in the showroom of the Cannock and District Gas Company. Though there was a commercial slant to the display, its main feature was salvage, and from that point of view it has proved very successful. With the full approval and co-operation of the local Council, the main showroom window carried the display for two or three weeks, after which a smaller edition was put in a side window where it has remained for more than a month. Large quantities of paper and cardboard have been saved, and many people make a habit of delivering their waste paper to the gas showroom

Three New Food Films

Contribution to National Campaign

A practical contribution to the National Food Campaign has been made by the Gas Industry in the production of three short sound films on food which were shown privately by the British Commercial Gas Association at Gas Industry House, on Sept. 17. The films have been presented to the Ministry of Food for exhibition throughout the country at the cookery demonstrations that are furthering the Ministry's National Food Campaign, and they will also be incorporated in the B.C.G.A. Film Library, so that they may be borrowed free of charge on application to Gas Industry House. Compared with some of the Ministry of Information films now being shown in London suburban cinemas the films are of a high standard from the entertainment and instructive point of view, and are designed to show people how to be fitter though rationed. The pictures are filmed by the Realist Film Unit and directed by Miss R. I. Grierson.

"Green Food for Health," a film about salads and green vegetables, shows how even in small back gardens and window boxes vegetables can be grown all the year round and thus add to the country's resources of home-produced food, and the audience is given some new and intriguing ideas for salads.

"Choose Cheese" deals with one of the country's most useful foods and indicates that 5 oz. of cheese give as much nourishment as a larger and more expensive piece of meat weighing 10 oz. Shots from cheese factories and attractive country scenes combine to tell a convincing story of the food value of cheese to manual workers and those who take plenty of exercise as well as to brain workers. The story is completed by illustrations of the results of tests with comparative diets of meat and vegetable for one group of children, and cheese, salad, wholemeal bread, and milk for another. "Choose Cheese," like "Green Food for Health," has a running time of five minutes.

"What's for Dinner?" is a nine-minute film about casserole cookery and is the only one of the three that introduces the use of a modern gas cooker, and then only in an unobtrusive manner. It shows how a certain Mrs. Bond, a paper-hanger's wife, solves the difficulties of rationing and the family's likes and dislikes by buying a shilling casserole and cooking a whole meal of neck of mutton and vegetables in a single dish. The message is put over in a light-hearted film featuring two popular comedians, Archie Harradine and Joan Sterndale-Bennett.

Last week's private view programme was completed by the showing of the Gas Industry's new documentary film, "It Comes from Coal," the story of the carbonization of coal and the wealth extracted from it. Sponsored by the Gas Industry and filmed by the Realist Film Unit, the picture will be seen not only throughout this country but also overseas. The British Council is arranging to show a special version of the film abroad as part of its campaign to tell the foreigner of Britain's achievements. Glimpses of normal gas-works practice are cleverly tied up with pictures showing the manufacture of the gun turrets of unsplinterable transparent plastics used on our fighting aeroplanes and the application of M. and B. 693, the new drug that has robbed pneumonia and spotted fever of more than half their terrors, both of which, in common with motor spirit for our Spitfires, explosives for our shells, fertilizers and sprays for the farmer, plastics and a host of other objects, owe their beginnings to the common source of coal.

Trade News

Staveley Coal & Iron Company, Ltd.

As from Monday, Sept. 23, the address of the Glasgow Office of the Staveley Coal & Iron Co., Ltd., is: Kennyhill Goods Depot, L.M.S. Railway, Cumbernauld Road, Glasgow. (Telephone: Provanmill 4488.)

Mr. H. Gillespie will be in charge, assisted by Mr. J. Ball. Attached to the office there is a stockyard which is being equipped with straight pipes and special castings ranging from 2 in. to 12 in. diameter. Mr. George H. Hutchison, of 200, St. Vincent Street, Glasgow, who has acted as the Company's agent for a great many years, is being retained in a consultative capacity.

Cochran Boilers

New leaflets dealing with the Cochran boiler and the Sinuflo gas-fired boiler respectively have been issued by Cochran & Co., Annan, Ltd. Owing to paper restrictions they have been produced somewhat in the form of abridgements of standard catalogues, but they contain all the essential information and some useful diagrams. The tubes in the Sinuflo gas-fired boiler introduce an entirely new principle into fire tube boiler practice, and transmit as much heat as straight tubes more than twice their length. The Sinuflo leaflet (No. 62 F) discusses the advantages of gas firing, not only from the point of view of efficiency but also on account of the automatic and instantaneous control of variations in load. Leaflet No. 60 F deals with the standard coal-fired Cochran boiler and gives detailed figures for coal consumption, evaporation under heavy and easy steaming, and hourly steam production for a range of 23 different sizes of boiler.

THE TECHNOLOGY OF GAS MANUFACTURE*

Fuel-Flue Gases

ONE approaches this first in the series which is to constitute the new edition of the American Gas Engineers' and the American Gas Chemists' Handbooks with the greatest of interest. Particularly so in view of the task which lies before The Institution of Gas Engineers in the preparation of our own Text-Book of the Gas Industry—a task which one is sure the Institution is waiting impatiently to begin once the present grave national emergency is over. For in spite of the facts that the manufacture and use of town gas originated in this country some 140 years ago, that the quantity of town gas made and sold in Great Britain is more than that made and sold in the whole of the rest of Europe, and that the consumption of gas per head of population is three times as great as that in any other country in Europe, there has been no adequate attempt to produce a Text-Book of Gas Manufacture in England during the last 20 years.

Mr. Alwyne Meade's original "Modern Gas-Works Practice" of 1921 is now well out-of-date. His "New Modern Gas-Works Practice" has stopped short with the first volume, published in 1934, which deals only with carbonization, coal and coke-handling. It is to be feared there is no prospect of this fine work ever being brought to completion, though one would like to think otherwise. Mr. W. B. Davidson's little book of 1923 was a handy volume in its day, and it, too, is already out-of-date besides being too elementary for so great a need. Mr. Hollings has produced the first volume, dealing with water gas, of a projected complete work, but there is no announcement of the other volumes. Mr. Coe's work on Gas Supply treats only one side of the subject.

"Technical Data on Fuel" published by the British National Committee of the World Power Conference, and last revised in 1935, is a very fine piece of work, but it refers only incidentally to gas-works practice. The excellent (American) Gas Engineers' Handbook (which is now under revision) was originally published in 1934. But we cannot claim that as a British production, and Professor J. J. Morgan's "Text-Book on American Gas Practice" can only serve as a standard below which we must not fall. For while one cannot expect, as already hinted, that the Institution should be making any progress at all with the compilation of the book, there is no reason why we in England should not be thinking about what sort of book we desire and how it should be produced.

Days of Specialization.

In the first place, it is clear that the compilation of a complete text-book on so vast a subject as this is beyond the power of any one man. These are days of specialization, and the men in possession of authentic information are too hard pressed by technical and administrative duties to afford the necessary time for lengthy writing. It is essentially a job for collaboration and "division of labour." Much of the information is already existing, but it is scattered over many separate papers and articles, and requires digestion and co-ordination. And frequent revisions are necessary to keep such a book up-to-date, particularly in view of the rapid development now taking place, and likely to take place in the future, in the technique of the Industry.

The question is, what are the objectives of the book? Many members of the Institution are thinking mainly of a text-book for students taking the Higher Examinations of the Institution, and this is surely no unworthy object. But it must also serve as a source of authentic information for the teachers and lecturers who are preparing the students for the examinations, and, if we are to hold up our heads in the world, it must be a full and complete collection of basic information for the use of gas engineers, designers, and operators alike.

The history of the American Gas Engineers' Handbook is an interesting one. It was prepared in the first place by the Gas Engineers' Handbook Committee of the Pacific Coast Gas Association, and the 1934 edition is certainly coloured by its origin in a region where oil gas is almost as important as coal gas. The book was reviewed and adopted by a special committee of the American Gas Association, and natural gas forms a strong feature of its composition. But it is an excellent example of the kind of co-operative production which is, or should be, contemplated by the British Gas Industry.

I trust I may be permitted to express some elementary ideas of my own about the standard which our Text-Book should attain. There may be some confusion arising out of the three objectives to which I have referred. But I do not see any reason why the British Text-Book should not, as indeed any good Text-Book does, make the fundamental principles clear. It need not necessarily be too elementary about that. But I am convinced that it would be fatal if our book stopped short of the full development of every important branch of the subject merely because of its difficulty or apparent abstruseness. Every student of military age should have the courage to face up to that, and it is pretty certain that the best will feel only contempt for any attempt to write down to inferior intelligence. One would not, however, like it to be thought that one is lusting for one of those mighty tomes which are put out by the German technologist. Some of that is mere weight. There can be sound scientific treatment without verbosity, and there are immortal books in English (such, for instance, as Clerk Maxwell's little "Text-Book of Heat") which show that it can be done.

This excellent American book purports to deal only with the "Application and Interpretation of Gas Analyses and Tests." It opens with a short introduction in which the main outlines of the fundamental principles of physics as concerned with gases are presented. The first chapter treats of fuel gas analyses, and this section, and, indeed, the whole book, is greatly enriched by references to specialized books dealing with each phase of the subject. This chapter is, perhaps, longer than the corresponding one will be in the British Text-Book, because of the inclusion of natural gas and its many constituents. It is of value for this reason alone. Chapter II is a neat treatment of the physical tests (specific gravity, specific heat, &c.) leading to an excellent treatment of the subject of flame temperature later in the book, though one cannot agree that, in view of its immense importance, heating value (calorific value) is anything like adequately treated in the very short space allotted to it. This is followed by an account of the application of gas analysis and, besides dealing with flame temperature, goes into many kinds of combustion calculations, gas flow and other problems which arise in the design of gas-burning appliances. In most cases the theoretical treatment is accompanied by a practical example fully worked out.

Chapter IV deals with Purging, and contains information which I have not seen collected together before, including a general treatment of the inflammability of gaseous mixtures with a useful bibliography, and is followed by a chapter on the specific constituents of fuel gases and their corrosive and other effects on the metals of which burners and other apparatus are composed.

In the section on organic sulphur there might have been a reference to the very fine work done and published by the Research Committee of our own Institution. Gum problems are dealt with under the heading of Deposits in Distribution Systems and this, too, would be enriched by more adequate reference to British work on the subject. Atmospheres, both in and out of furnaces, are given two useful and somewhat unusual chapters, and the book concludes with an account of Flue Gas Analysis methods with some particularly useful examples of the application and working out of the result of Orsat tests, as, for instance, in domestic appliances. And there is an excellent index.

Worthy of Great Traditions.

So far, then, the book is worthy of the great traditions of the American Gas Association and of its two predecessors. But in view of the consideration which must be given, when circumstances again permit, to the British Text-Book, it will not be out of place to make some remarks on its outside appearance, its size, and the arrangement of the printed matter which are, one can be sure, very different from what the Institution has in view for the British book.

The book is 11 in. deep by 9 in. wide. It consists of 198 pages with the printed matter arranged in two columns, the printed area being 9 in. deep by 6½ in. wide. Obviously so large a page gives plenty of room for large legible diagrams, and nearly every table is printed to be read "the right way up"—one has not to turn the book round to read them. On the other hand, the paper has, rather surprisingly, an unfinished matt surface, which makes the type very pleasant reading, but has the, to my mind, serious limitation that the use of half-tone blocks is precluded, while even line blocks do not give particularly good results. The reproduction of photographs is impossible on this paper.

The binding is a fawn-coloured linen-covered board, and the title is done in two colours, blue and red, with a very neatly designed monogram of the A.G.A. with the symbolic flame resting upon it. Not, that is to say, what is generally associated with a scientific text-book—but, still, by no means unpleasant.

But while one is left wondering whether this combination of text-book and data-book is quite what one would like to see in the forthcoming text-book of the British Gas Industry, it is important to note the very high standard which the American book attains. No lower standard should be acceptable to us in England.

Finally, it is undeniable that the problem of cost is a difficult one. It is too much to hope that a complete and adequate treatment of the technology of gas manufacture can be accomplished in a cheap book, and the book must not be cheap in any sense whatever. If a suggestion is put forward here, it must be understood that it is a purely individual expression of opinion. There are two ways in which this difficulty could be bridged. The Industry as a whole might subsidize the book—either the complete issue or those copies which are issued to members of the Institution and the District Associations and to *bona fide* students. This might well involve a considerable financial obligation, but it is contended that it should be looked upon as expenditure upon the development and maintenance of the quality of the personnel of the Industry, akin in importance and effect to that upon technical research and commercial development.

T. A. T.

* American Gas Association, New York, 1940; Five dollars.

CONSTITUTION OF ARTIFICIAL CARBOHYDRATE COALS

From *Industrial Engineering and Chemistry*

By

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FISCHER and co-workers (*3*) and Bone (*2*) have defended the viewpoint that natural bituminous coal could not have been formed from cellulose and other carbohydrates, because when these materials are oxidized with air under pressure in the presence of alkali or are oxidized with permanganate and alkali, only aliphatic oxidation products are obtained. Natural bituminous coals give oxidation products of partly aromatic nature just as lignin and its derivatives do. Therefore it was concluded that the aromatic lignin, and not the aliphatic carbohyrates, is the parent material of bituminous coals.

The error of such a conclusion comes from the fact that those Authors investigated the oxidation products of cellulose and other carbohydrates and not the oxidation products of cellulose coals. The chief object of this study was to determine whether cellulose coals would also give aromatic products through oxidation. If this could be confirmed, the objections of Fischer and of Bone would be void. The preparation, oxidation, and isolation of those products are described here.

Experiments on Cellulose Coal

Preparation.—Two hundred grammes of cotton linters were heated in a rotating bomb with one litre of 0.05 *N* sodium hydroxide solution at 325° C. A black solid coal and small amounts of black tar which solidified at room temperature were separated by filtration from the dark-coloured acid solution. The analysis of these reaction products gave : Carbon 79.93%, hydrogen 4.89%, ash 4.5% (calculated on an ash- and water-free basis).

Oxidation.—A 118.3 gramme portion of this wet cellulose coal, corresponding to 74 grammes of dry material, was ground to 150 mesh and oxidized with about 400 grammes of hydrogen peroxide (1,333 grammes of 30% hydrogen peroxide), diluted to about 5% hydrogen peroxide content at room temperature. Every day for 12 days 33 grammes of hydrogen peroxide (110 grammes of 30% hydrogen peroxide) were added. In order to stabilize the peroxide, 20 c.c. of a 40% sodium silicate solution were added. The solution was kept slightly alkaline by the addition of the necessary amounts of sodium hydroxide. After 12 days the unattacked material (58%) was separated by centrifuging. The solution was used for the determination of the carbon balance and the identification of some of the acids formed.

Carbon Balance.—The total amount of carbon was determined through oxidation of an aliquot with chromic and phosphoric acid according to the oxidation method (*1*). Carbonic acid was determined by the same procedure with phosphoric acid alone. The carbon content of volatile acids expressed as acetic was calculated. The difference between the total carbon content, determined by oxidation with chromic and phosphoric acid, and the sum of the carbon expressed as carbonate, acetate, and oxalate carbon represents the aromatic hydrocarbons.

Nature of Oxidation Products.—The yellow watery solution obtained by the oxidation with alkaline hydrogen peroxide was evaporated *in vacuo*. The resulting salts were acidified with dilute sulphuric acid, and after steam distillation, volatile acids similar to acetic were separated. Acetic acid was identified as acetotoluide, melting point 110° C. This preparation did not show any depression of melting point when mixed with a C. P. sample.

The remaining brown solution contained other formed acids and colloidal silicic acid which was filtered off. Residue and filtrate were separately extracted with ether. The evaporated extracts were dried over P_2O_5 at 50° C. They were soluble in ether and partly soluble in water.

TABLE II.—CARBON DISTRIBUTION IN SODIUM SALTS OF OXIDATION PRODUCTS OF CELLULOSE COAL.

Carbon.	Grammes.	%
Total	25.0	100.0
As carbonic acid	12.1	48.5
As acetic acid	0.5	2.0
As oxalic acid	2.7	11.0
Difference, containing aromatic acids	9.7	38.5

The water-insoluble, slightly gray-green amorphous acid was separated by filtration and dissolved in hot water. No crystals could be obtained in this way. The amorphous colourless substance with a melting interval between 240° and 270° C. was methylated with diazomethane; slightly yellow material was formed. Treatment with methanol-water gave colourless needles with a melting point of 73° C. Analysis: carbon 70.82%, hydrogen 5.22%; calculated for $C_{16}H_{14}O_4$: carbon 71.09%, hydrogen 5.18%. A sample mixed with the dimethyl ester of diphenic acid prepared from phenanthrene showed no depression in melting point.

The water-soluble acids were treated with ammonia at 0° C. A crystalline colourless precipitate resulted. After acidification and ether extraction, the resulting free acids were methylated and their esters were separated by distillation. The dimethyl ester of oxalic acid could be isolated (colourless needles, melting point 54° C.). Analysis: carbon 40.8%, hydrogen 7.51%; calculated for $C_4H_6O_4$: carbon 40.66%, hydrogen 5.12%. Furthermore, the hexamethyl ester of mellitic acid (boiling point 220° C. at 0.1 mm. of mercury) could be isolated. After crystallization from methanol-water, colourless needles with a melting point of 186-187° C. were obtained. Analysis: carbon 50.78%, hydrogen 4.19%; calculated for $C_{18}H_{18}O_{12}$: carbon 50.7%, hydrogen 4.25%. The substance showed no depression when mixed with an authentic sample of the hexamethyl ester of mellitic acid.

The ammonia solution free from mellitic and oxalic acids was concentrated, acidified, and extracted with ether. The ether extract was dried over P_2O_5 and, after evaporation of the ether, was methylated with diazomethane. The esters were distilled at a pressure of 1 mm. of mercury. At 200-260° C. small amounts of sublimation products (0.2% of the methylated material) were obtained as colourless crystals (melting point 140° C.). Analysis: carbon 61.82%, hydrogen 5.02%; calculated for $C_{10}H_{10}O_4$: carbon 61.83%, hydrogen 5.15%. No depression in melting point was observed when this preparation was mixed and melted with the dimethyl ester of terephthalic acid.

The remaining part which did not distil was treated in a high-pressure bomb with double the amount of sodium hydroxide by heating the mixture 10 hours at 325° C. The dark brown solution was acidified. A tan coloured precipitate was obtained. By crystallization from hot water and sublimation at 300° C. colourless needles with a melting point of 328-329° C. were obtained. Analysis: carbon 57.98%, hydrogen 3.50%; calculated for $C_8H_6O_4$: carbon 57.82%, hydrogen 3.64%. No depression was observed when this sample was mixed with isophthalic acid and melted.

TABLE I. ACIDS OBTAINED FROM ARTIFICIAL COAL BY OXIDATION WITH ALKALINE HYDROGEN PEROXIDE.

Acid.	Identified as	Composition % found C	Composition % found H	Composition % calcd. C	Composition % calcd. H	M. P., ° C. Found	M. P., ° C. Recorded.	G. Identified Acids per 100 G. Cellulose Coal.
Acetic	Acetotoluide	72.22	7.51	72.47	7.38	108–9	109	1.8
Oxalic	Dimethyl ester	40.80	4.97	40.66	5.12	54	54	7.6
Diphenic	Dimethyl ester	70.82	5.22	71.09	5.18	73	73	0.5
Mellitic	Hexamethyl ester	50.78	4.19	50.70	4.23	186–7	187	2.4
Terephthalic	Dimethyl ester	61.82	5.02	61.83	5.15	140	140	0.6
Isophthalic	Isophthalic acid	57.98	3.50	57.82	3.64	328–9	330	Small amounts.

This study proves that, when cellulose coal produced at high temperatures from pure cellulose in a weak alkaline medium is oxidized with hydrogen peroxide at room temperature, about 40% water-soluble oxidation products are formed. These are composed of carbonic, acetic, and oxalic acids, and contain also cyclic acids. These rin compounds are mellitic, diphenic, iso- and terephthalic acids, and other unidentified material.

There is no doubt that part of the carbonic and oxalic acid results from the oxidation of aromatic substances. It has been proved (*1*) that benzoic and salicylic acid can be converted partly into carbonic acid under relatively mild conditions. Therefore, cellulose coals give the same oxidation products as natural bituminous coal, and the views of Fischer and Bone are erroneous.

Literature Cited

[1] Berl, E., and Koerber, W., " Ind. Eng. Chem.," Anal. Ed., 12, 245 (1940).
[2] Bone, W. A., " Coal : Its Constitution and Uses," p. 181 ff., London, Longmans, Green & Co., 1936.
[3] Fischer, Franz., and co-workers, *Brennstoff-Chem.*, numerous papers.

Manchester and District Juniors

The 42nd Annual General Meeting of the Manchester and District Junior Gas Association will be held on Saturday, Sept. 28, at 2 p.m., in the Engineers' Club, Albert Square, Manchester. Luncheon will be arranged at the Club at 12.30 p.m. for those members who notify the Hon. Secretary not later than Friday, Sept. 27.

When the business of the Annual Meeting is concluded, the President will open an informal discussion on " Air Raid Precautions in the Light of Recent Experiences." No report will be taken, and it is hoped that many members will contribute to the discussion.

It is appreciated that additional duties will prevent many from being present, but every member who is able to attend is urged to support the meeting.

NEW PATENTS

A Gas Fire Patent

The subject of a patent (No. 524,242; application date, Jan. 25, 1939) granted to the Parkinson Stove Company and H. T. Angus, is a gas fire in which openings or perforations are formed in the back brick and the products of combustion from the burners are evacuated through the back brick into a flue by suction induced in the fire itself or in the flue.

The upper end of the space in which combustion of the gas takes place, and which may be occupied by radiants or may simply be a space between a back brick of refractory material and a front fret, is closed so that no products of combustion can escape there

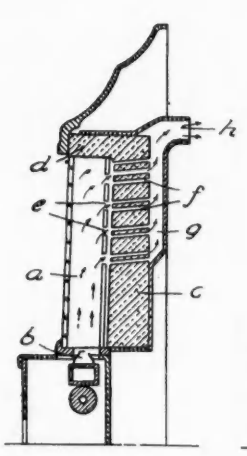


Fig. 1

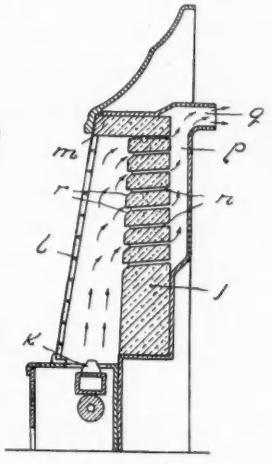


Fig. 2

and the whole of the products of combustion are evacuated through the back brick into a flue arranged at the back of the fire.

Where hollow radiants of normal type are used they are provided with openings in their rear walls through which the products of combustion pass into the openings in the back brick.

Where combustion takes place in the space between the back brick and a front fret of refractory material spaced a short distance from it the surface of the back brick is raised to incandescence by the flames drawn through it, and the surface may be formed with ribs or projections which will attain a high temperature rapidly.

The openings in the back brick may be in the form of perforations or slots and they may be evenly distributed over the area of the brick or they may be confined to one or more portions of the surface, as for example at the top or in the centre of the brick. In some cases the openings may extend rearwardly from transverse undercut grooves in the front surface of the brick so that they are not normally visible from the front of the fire.

The burners need not necessarily be arranged at the bottom of the brick, and in one arrangement burners may be located at the sides of the brick in conjunction with radiants inclined upwardly and inwardly towards the centre of the brick where openings are provided for the discharge of the products of combustion.

Two practical designs of gas fire embodying the invention are illustrated diagrammatically in the accompanying drawings, in which Fig. 1 is a vertical section of a fire having hollow radiants, and Fig. 2 is a similar section of a fire without radiants but having a front fret spaced from the back brick.

In the fire shown in Fig. 1 hollow radiants *a* heated by the flames from burner nozzles *b* below their open lower ends are arranged in front of a back brick or block *c* of refractory material. The upper part of the back brick *c* is extended forwardly over the upper ends of the radiants as shown at *d* so that the upper ends of the radiants are closed. Openings *e* are formed in the rear walls of the radiants in alignment with slots or openings *f* passing in a horizontal or in a slightly inclined direction through the back brick. Thus the products of combustion pass out of the radiants through the openings *e* and pass through the openings *f* in the back brick into a chamber or passage *g* at the back of the fire and so to a flue outlet *h*.

In the fire shown in Fig. 2 the back brick *j*, which is of substantial thickness, itself forms the heat radiating surface and its front surface is heated to incandescence by the flames from burners *k* arranged in front of it at the bottom. The front face of the back brick is slightly inclined and a fret *l* of refractory material inclined at a slightly greater angle is arranged a short distance in front of the back brick. The upper end of the space between the back brick and the fret is closed by a forward extension *m* of the back brick. Combustion of the gas takes place in this space and the products of combustion pass out through slots *n* in the upper part of the back brick into a passage *p* at the back of the fire from which they pass into a flue *q*. The front ends of the slots in the back brick may be chamfered off on their lower edges as shown at *r* to facilitate the entry of the products of combustion and to assist in concealing the presence of the slots when viewed from the front of the fire.

Cooker Splash Plates

Gas cooker splash plates form the subject of a patent taken out by Radiation, Ltd., H. J. Yates, and H. Marston (No. 523,414; application date, Jan. 5, 1939).

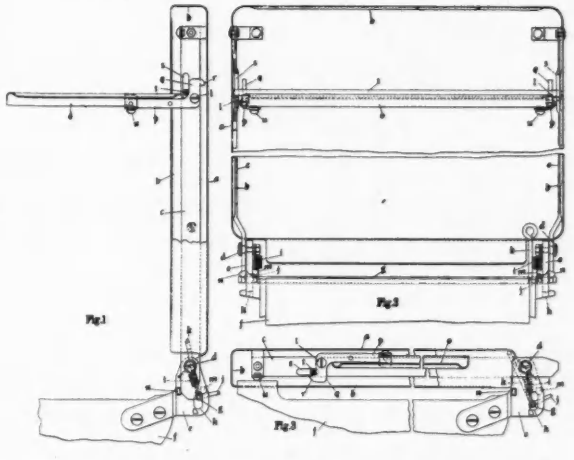
In the accompanying drawings, Figs. 1 and 2 are a part sectional side elevation and a part sectional front elevation of a splash plate embodying the invention, the splash plate being shown in its vertical position. Fig. 3 is a view similar to Fig. 1 showing the splash plate in its folded position.

The splash plate *a* is made from a metal sheet having flanged edges *b*. To the interior surface of each of the pair of opposite side flanges *b* is secured a reinforcing bar *c* which extends beyond the rear or lower edge of the plate *a*. The plate *a* is supported at its rear or lower edge by pivots *d* on a pair of brackets *e* adapted to be attached to the upper rear part of the cooker *f*, the pivots being formed by a pair of pins which pass respectively through holes in the extended ends of the reinforcing bars *c*, and which are in screw-threaded engagement with the corresponding brackets.

For locking the plate *a* in its vertical position at the rear and above the top of the cooker *f*, on the brackets *e* is carried a locking bar *g* which passes through vertical slots *h* in the brackets and lies parallel with the adjacent edge of the plate. The bar *g* is so located that when the plate *a* is in its vertical position the bar can engage the rear sides of the extended ends of the reinforcing bars *c*, and so hold the plate securely, the locking bar being held in its operative position by springs *i* which may be attached to the ends of the locking bar and to the pivot pins *d* or convenient parts of the brackets *e*.

For enabling the bar *g* to be manipulated, secured to it are a pair of similar radial levers *j* and a third radial lever *k*. The two levers *j* are arranged parallel with each other and near opposite ends of the bars *g*. Also these two levers are arranged to extend rearwardly in relation to the cooker *f* and beneath abutments *m* on the inner sides of the adjacent brackets *e*. The third lever *k*, which has the form of a finger lever, is situated near one of the levers *j*, and extends upwardly in relation to the cooker *f*.

To release the locking bar *g*, the outer end of the finger lever *k* is depressed in a forward direction. In this action the levers *j* bear against the adjacent abutments *m*, and cause the bar to be



depressed, against the action of the springs *i*, to a position clear of the extended ends of the reinforcing bars *c*. The plate *a* can then be folded down on to the top of the hotplate of the cooker *f* and serve as a cover. On again raising the plate *a* to its vertical position the extended ends of the reinforcing bars *c* depress and ride over the locking bar *g* until the vertical position is reached, when the locking bar moves automatically into its operative position under the action of its springs *i*, the vertical position of the plate being determined by contact of the ends of the reinforcing bars with projections or stops *n* on the outer sides of the adjacent brackets *e*.

When it is required to combine a plate or other rack as *o* with the front face of the splash plate *a*, we attach the rear edge of the rack to the reinforcing bars *c* by pivots *l* which pass through holes in a pair of supporting bars *p* secured to the sides and extending beyond the rear edge of the rack. Formed on the extended ends of the supporting bars *p* are extensions *q* which

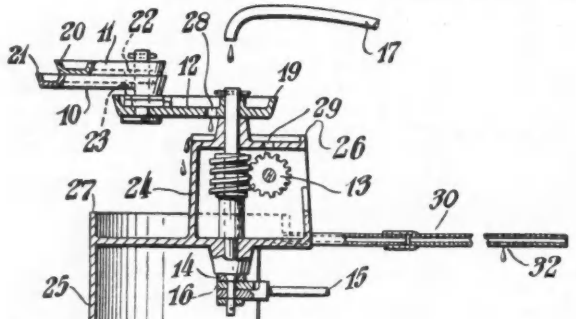
extend upwardly beyond the pivots *l*, and which are formed at their upper ends with rearwardly extending projections *r*. The portions of the reinforcing bars *c* adjacent to the extensions *q* of the supporting bars *p* are formed with slots *s*, and in these slots are located the ends of a rack-locking bar *t* which lies parallel with the rear edge of the rack *o* and which can engage the extensions. When the rack *o* stands at right angles to the plate *a* it is secured by the engagement of the bar *t* with the fronts of the extensions *q*. When it is required to put the rack *o* out of use or to fold the splash plate *a* on to the top of the cooker *f*, the rack-locking bar *t* is first raised by hand to free the rack, and then the latter is folded or allowed to swing downwardly to a vertical position in which it is arrested by contact of rubber or other resilient cushioning studs *u* on the rack with the inner face of the plate. The locking bar *t* is then allowed to fall into a position in which it engages the projections *r* on the supporting bar extensions *q* for retaining the rack *o* in its out-of-service or folded position. To return the rack *o* to its service position, the locking bar *t* is again raised by hand to free the rack, which is then raised until the extensions *q* are clear of the locking bar, whereupon the latter falls into engagement with the extensions and so secures the rack.

Lubrication of Dry Gas Meters

Lubrication of the working parts of dry gas meters is the subject of a Patent (No. 524,616; application date, Feb. 4, 1939), taken out by R. V. Steed.

The device is shown in the accompanying diagram. A lubricant supply pipe 17 is fixed in the front wall of the casing of the meter and has an inlet which is adapted to be closed in a gas-tight manner such as by a screw closure. The supply pipe 17 has an outlet over the centre of the tangent crank shaft. The tangent crank 12 has an enlarged centre and is formed with turned up flanges 19 forming a lubricant reservoir on the top of the tangent crank. The flag arm connecting rods 10 and 11 also have similar reservoirs formed above them by means of flanges 20 and 21. The supply pipe 17 discharges lubricant above and into the reservoir on the tangent crank 12 and also into the reservoirs on both connecting rods 10 and 11, the latter receiving the lubricant in turn while passing underneath the supply pipe outlet when in operation. In addition there is a duct from the upper connecting rod 11 to the lower connecting rod 10 and also one from the latter to the tangent crank 12. The two ducts are formed by holes 22 and 23. It will be seen that the lubricant in the three reservoirs referred to will have access to the tangent crank shaft bearing and the flag arm pin and tangent crank pin bearings at either end of the connecting rods.

The worm and wheel index drive 13 is protected from the direct flow of gas by a casing 24 which encloses the drive 13. The



casing 24 is mounted on the top of a semi-circular casing 25 partially enclosing the valve actuating crank 14 and similarly protecting the latter from the direct flow of gas. The casing 24 has upstanding flanges 26 on three sides thereof and the semi-circular casing 25 has relatively deep upstanding flanges 27 all round. A duct in the form of a hole 28 in the tangent crank 12 enables lubricant to flow from the latter into the reservoir formed by the flanges 26 on the casing 24. A further duct 29 conducts the lubricant on to the index drive 13. From the top of the casing 24 the lubricant can overflow into the reservoir formed on top of the casing 25.

Pipes distribute the lubricant from the reservoir on top of the casing 25 on to the slide valves to lubricate the sliding faces thereof. The ends of the pipes are closed, but lubricant discharges on to the valves through small holes in the pipes.

The lubricating means described enable the moving parts of the meter to be lubricated without disconnecting and dismantling the meter. Lubricant is introduced from a single point, namely the inlet of the supply pipe 17 whereby oil is supplied to the reservoir on top of the tangent crank 12. Preferably lubrication is effected while the meter is working so as to be sure to supply lubricant into the reservoirs on top of the two connecting rods 15 and 16 also. These also distribute the lubricant further through the ducts 22 and 23. From the top of the tangent crank 12 lubricant is fed on to the index drive 13 and to the crank-shaft as already stated, through the ducts 28 and 29 and from the top of the casing 24 the lubricant is finally discharged on to the slide valves.

It is possible to provide a lubricant supply to further moving parts by the provision of more pipes, reservoirs, ducts and channels similar to those already described. Also the oil reservoir on top of the casing 25 may have an oil wick to supply oil to the crank pin bearing in the end of the valve actuating crank 14.

Coke Discharge in Intermittent Verticals

Among the new patents is one (No. 524,309; application date, Jan. 26, 1939) concerning coke discharge from intermittent vertical retorts which has been taken out by West's Gas Improvement Company, Ltd., and Sir Frederick J. West. Its object is to simplify the means which support the charge in the retort during coke dis-

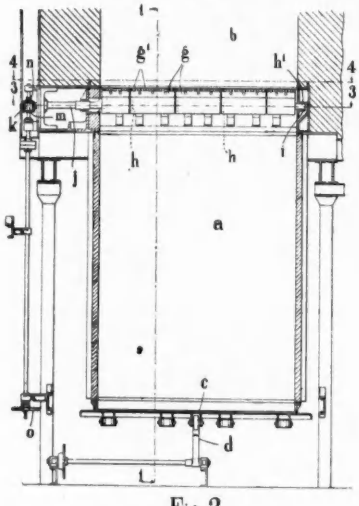


Fig. 2

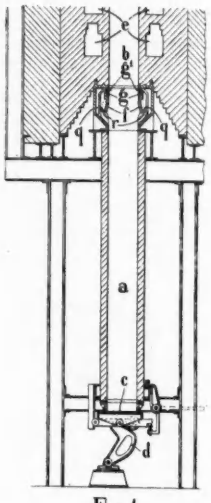


Fig. 1

charge and which facilitate the cutting off of the charge in the retort from the coke being discharged.

Referring to the accompanying explanatory drawings, Fig. 1 is a cross-sectional view on the line 1—1 of Fig. 2, Fig. 2 a longitudinal sectional elevation, Fig. 3 a sectional plan view on the line 3—3 of Fig. 2, and Fig. 4 a plan view on the line 4—4 of Fig. 2 showing a vertical retort with coke holding-up means in accordance with this invention. Fig. 5 is an end view looking from left to right in Fig. 3.

a indicates the coke cooling chamber and *b* the lower portion of the carbonization space, *a* and *b* together constituting a complete vertical retort from which the coke is discharged at the bottom when the door *c* is opened by withdrawing its support *d*.

The combustion chambers are shown at *e*. Beneath the lowest combustion chamber *e* there are provided, along each of the long sides of the coke chamber, a series of pivotally mounted and interconnected hollow members *f* to each of which is secured a plate *g* having projecting teeth or claws g^1, as shown in Figs. 1 and 4. The teeth or claws project a short distance into the vertical throughway space down which the coke travels on its way from the carbonization space to the discharge door *c* and do not come adjacent one another from the opposite sides of the coke chamber. Each intermediate member *f* has a rectangular projection *h* at one side and a similar recess at the other side, the inter-engaging projections and recesses of all the members being in axial alignment and constituting (in conjunction with the end pieces h^1 in bearing supports *i* and the operating spindles *j*) axles about which the members can turn to withdraw the teeth or claws from the coke space of the retort or to bring them into such space to the extent indicated in the drawings. The ends of the spindles *j* are coupled by means of the arms *k* to a nut *m* upon a vertical screw *n* which is turned by a hand wheel *o* for the purpose of moving the teeth or claws into and out of their service position in the coke space.

When the teeth or claws g^1 are moved to project into the coke in the coke chamber, they exert a squeezing action on the more or less incandescent coke, which causes them to embed themselves in the coke and to grip it on a plane extending between the claws at the opposite sides of the chamber. This ensures that the coke is held up by the claws at that plane without it being necessary to exert any very heavy pressure upon the claw operating mechanism and hand wheel *o* and without the liability of any hard mass requiring to be broken up before the grip is obtained, such as is the case when gripping teeth have to interlace and overlap from the opposite sides of the coke chamber to obtain the desired hold-up of the coke charge.

When coke discharge is to be effected the teeth or claws g^1 are caused to project into, so that they make an impression in,

the hot coke mass, their positions then being as shown in Fig. 1. The discharge door *c* is opened and the contents of the coke chamber fall therethrough. The door *c* is then closed and the teeth or claws withdrawn from the coke space by turning the

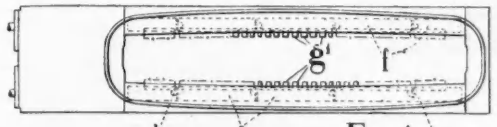


Fig 4

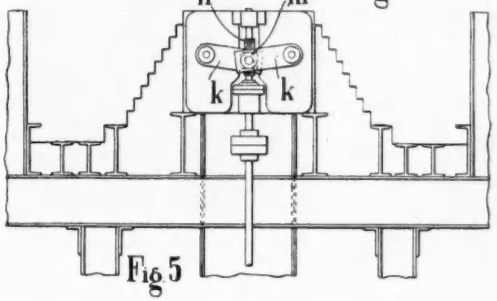


Fig 5

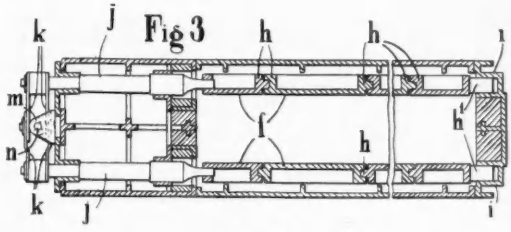


Fig 3

members *f* through the medium of the hand wheel *o*, screw *n*, nut *m*, levers *k*, and spindles *j*. The carbonized charge in the space *b* then falls into the coke chamber *a*. It is sufficient in volume to extend above the teeth or claws g^1 so that the teeth or claws g^1 can press therein when moved to the Fig. 1 position. A new charge of coal is now fed into the top of the retort and is carbonized.

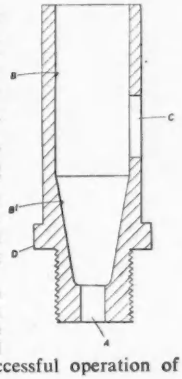
The lower ends *q* of the members *f* are shaped as parts of cylinders and move in fixed brackets *r* of similar shape so that no coke can pass behind the members during their movements.

The employment of several members *f* inter-coupled by projections and recesses *h* minimizes the effects of the temperature upon the members and reduces buckling and distortion.

Burner for Gas-Fired Boilers

A patent (No. 524,505; application date, Jan. 31, 1939) for a burner where the amount of gas used is subject to control in accordance with the varying conditions of the boiler has been granted to Cochran & Co., Annan, Ltd., W. Holland, and P. St. G. Kirke.

The burner comprises a relatively short capillary gas metering inlet passage, a mixing chamber of greater length than the capillary passage and of from three to two-and-a-half times the diameter of the gas inlet passage, and an air inlet opening of approximately the same cross-sectional area as the mixing chamber formed in the lateral wall of the mixing chamber about midway in its length. The lower end of the mixing chamber is tapered or of truncated conical shape to join the upper end of the capillary gas inlet passage, and the conical portion of the mixing chamber is approximately three times the length of the gas metering inlet passage. Preferably the diameter of this tapered portion at its lower end is approximately equal to the length of the gas metering inlet passage and the total length of the mixing chamber (including the tapered portion) is either approximately three-and-a-half times its diameter or between seven and eight times the length of the gas metering inlet passage.



The above proportions are found suitable for ordinary town gas having a pressure from 2 to 6 in. W.G., but these proportions can be varied within 5% in an upward or downward direction without materially affecting the successful operation of the burner.

A burner such as that described, state the patentees, may take the place of the ordinary luminous flame burners used in geysers and water heaters where variation in the water pressure or some other factor automatically controls the amount of gas admitted to the burner.

The accompanying drawing shows the burner in sectional side elevation.

It comprises a short length of brass tubing having a capillary gas inlet passage A of $\frac{1}{8}$ in. in diameter and $\frac{3}{16}$ in. in length. This metering passage leads directly into the mixing chamber B which is $\frac{5}{16}$ in. or $\frac{3}{8}$ in. in diameter and approximately $1\frac{1}{2}$ in. in length. The lower end of this mixing chamber is tapered, as shown at B1, the tapered portion being approximately three times the length of the inlet passage A and the diameter of the tapered portion at its lower end being approximately $\frac{3}{16}$ in.—*i.e.*, equal to the length of the gas metering inlet passage. The total length of the mixing chamber in the example illustrated, including the tapered portion at its lower end, is between seven and eight times the length of the gas metering inlet passage A. When the burner has a larger bore, the length of the mixing chamber is preferably about three-and-a-half times its own diameter.

Formed in the lateral wall of the mixing chamber is an air inlet opening C the diameter of which is approximately equal to that of the upper end of the mixing chamber, and the centre line of this opening is slightly above midway in the length of the mixing chamber. In the particular example shown the centre line of this opening is $\frac{13}{16}$ in. from the base of the mixing chamber and $\frac{5}{8}$ in. from its upper end. In all cases the distance between this centre line and the upper end of the tube should not be less than twice the diameter of the air inlet.

The lower end of the gas inlet passage A is externally screw-threaded and the tube constituting the burner is provided near its base with a hexagonal nut D by which it can be secured to the gas supply pipe or other support. With ordinary town gas when the gas is throttled so that it represents only 1% of its full supply, the burner will remain alight with a blue flame approximately opposite the air inlet opening C. When the supply of gas is increased, the flame will not be extinguished but will rise in the tube and eventually build up at the end of the tube (automatically cutting out the flame inside the tube) to a height dependent upon the amount of gas admitted and in accordance with the requirements of the burner. The patentees state that a burner in accordance with the present invention is far quieter in operation than one having an ordinary luminous flame.

Gas Undertakings' Results

Accrington

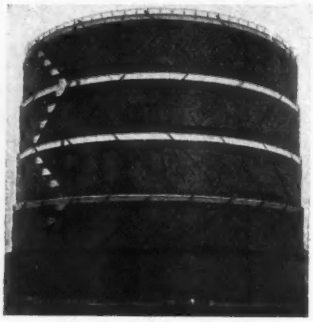
A net deficit of £2,078 has resulted from the operations of the Accrington District Gas Board for the past financial year. The quantity of gas sent out was 624,032,000 cu.ft., an increase of 12,452,000 cu.ft. when compared with the total of the preceding twelve months; while the quantity accounted for was 19,932,000 cu. ft. higher, at 598,740,000 cu.ft. The proportion of unaccounted-for gas shows a reduction from 6.83% to 5.5%. The sales were divided up as follows: Prepayment consumers, 48.81%; industrial purposes, 30.27%; public lighting, 0.33%; other consumers, 19.88%; and used by Board, 0.71%. The net deficit on the previous year's working was £3,020.

Airdrie

The Airdrie Corporation Gas Department report that for the past financial year the make of gas totalled 144,130,000 cu.ft., which is an increase of 7,685,000 cu.ft., or 5.63%, on the make of the preceding twelve months. Gas sales amounted to 135,384,500 cu.ft.—an increase of 6,980,500 cu.ft., or 5.43%. Returns from ordinary and prepayment consumers are up by 3.66%; while the development in the area of supply of existing industry, coupled with the introduction of new ones, resulted in industrial meters registering a consumption of 27,497,700 cu.ft., as against 6,445,300 cu.ft. in the previous year, or an increase of 21,052,400 cu.ft.

Middlesbrough

For the first five months of the financial year—that is, up to the end of August, 1939—the County Borough of Middlesbrough experienced a satisfactory increase in gas output of 5.82%, when compared with the corresponding period of the previous year but subsequent war conditions resulted in the sales for the complete twelve months to March 31 being reduced from 1,332,090,000 cu.ft. to 1,300,559,300 cu.ft. The net profit of £26,268 is an increase of £8,765 on the figure of £17,503 for the previous year. This increase is due chiefly to a smaller quantity of gas having to be manufactured than in the preceding year, owing to greater quantities of coke-oven gas being made available from the Acklam Works. The number of meters in use at the end of March was 39,281—an increase of 813 over the total a year ago. There are now 256 miles of mains in the area of supply of the Gas Department. During the year callers at the showrooms numbered 35,000. Further central heating installations have been put into operation, and the quantity of gas sold for this purpose increased by 16.9% on the figure for the preceding year, to 97,000,000 cu.ft. At March there were 81 of these installations, embracing 94 boilers. Additional industrial loads have been secured.



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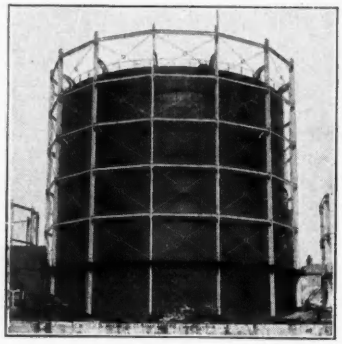

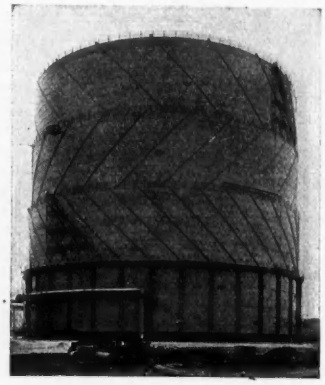

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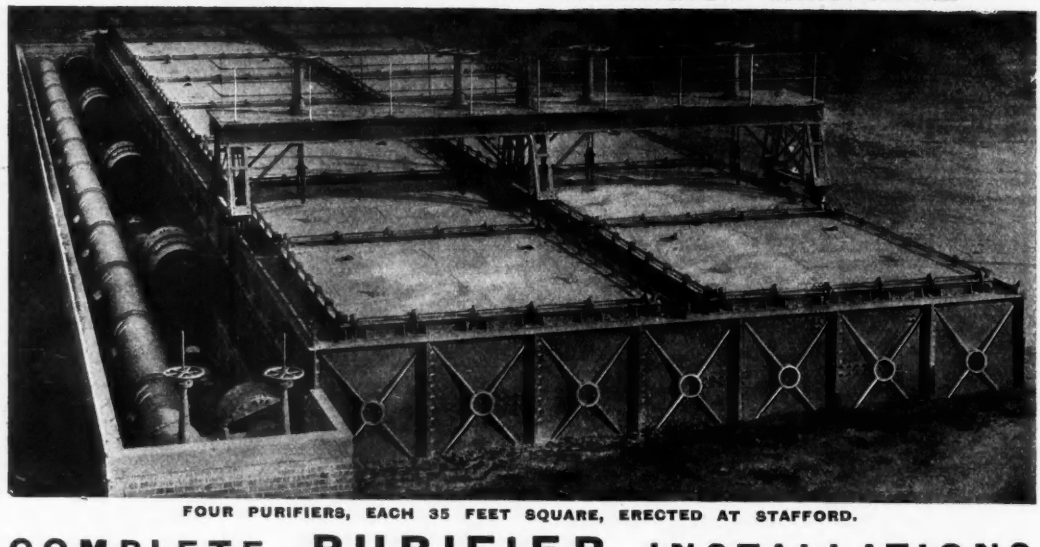

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Gas Products Prices

The London Market

Sept. 23.

Current values of Tar products in London are as follows: Pitch remains nominal, creosote is about 4⅜d. to 5d. per gallon, refined tar 3⅜d. to 4d., the price of pure toluene under the Ministry of Supply Toluene No. 2 Order is 2s. 5d. per gallon, pure benzole 1s. 10d., 95/160 solvent naphtha 1s. 11d. to 2s. 0d., and 90/160 pyridine about 17s. 6d. all per gallon naked, refined naphthalene crystals £23 per ton in bags, all *ex* Makers' Works.

The Provinces

Sept. 23.

The average prices of gas-works products during the week were: Pitch and Crude Tar.* Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North 9d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North liquid and salty, 4½d. to 4¾d.; Scotland, 4½d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4½d. Carbolic acid, 60's, 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6½d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note in our issue of Sept. 4, p. 404.

Scotland

GLASGOW, Sept. 21.

Export enquiries and orders are more plentiful and prices generally are maintained at previous levels.

Refined tar.—A moderate throughput is maintained in the home market at 4¼d. to 4½d. per gallon, while for export business is being arranged at 3½d. per gallon, both f.o.r. naked.

Creosote oil.—While there is not a great volume of new business being placed, deliveries are proceeding rapidly and prices are unchanged as follows: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6d. to 6½d. per gallon; neutral oil, 5¾d. to 6d. per gallon; all *ex* Works in bulk.

Cresylic acid remains weak with supplies readily available as under: Pale, 99/100%, 2s. 2d. to 2s. 4d. per gallon; Pale, 97/99%, 1s. 11d. to 2s. per gallon; Dark, 97/99%, 1s. 7d. to 1s. 9d. per gallon; all *ex* Works in buyers' packages.

Crude naphtha is changing hands at 6½d. to 7½d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 8½d. to 1s. 9d. per gallon and 90/190 heavy naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

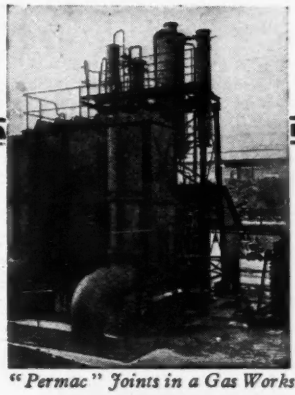
Motor benzole is 1s. 8d. to 1s. 8½d. per gallon.

Pyridine.—90/160 grade is 17s. to 18s. per gallon and 90/140 grade is 19s. to 20s. per gallon.

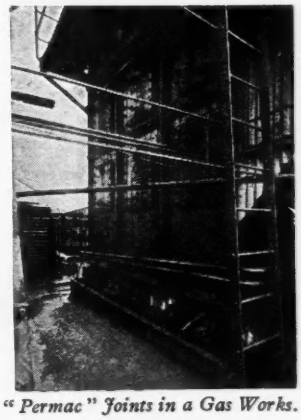
Dividend Announced

Vickers, Ltd.

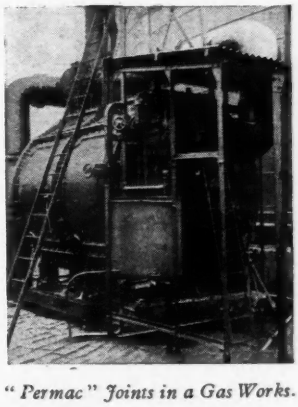
The Directors of Vickers, Ltd., give notice that an interim dividend of 4% (actual), less income tax, on the ordinary stock of the Company in respect of the year 1940 will be paid on Oct. 24.



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.



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Bratt Colbran, Ltd.	521
Bray, George, & Co., Ltd.	516
British Gas Purifying Materials Co., Ltd.	549
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Evans, Joseph, & Sons (Wolverhampton), Ltd.	518
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Gas Meter Co., Ltd.	522
Gas Purification and Chemical Co., Ltd.	549
Gibbons Bros., Ltd.	524
Glenboig Union Fireclay Co., Ltd.	519
Glover, George, & Co., Ltd.	513
Glover, Thos., & Co., Ltd.	528
Goodall, Clayton, & Co., Ltd.	Cover IV
Grant, David, & Co.	525
Green & Boulding, Ltd.	549
Griffiths Bros. & Co. (London), Ltd.	537
Hamilton, Archd. H., & Co., Ltd.	520
Head, Wrightson & Co, Ltd.	525
Holmes, W. C., & Co., Ltd.	551
Horseley Bridge and Thos. Piggott, Ltd.	519
Humphreys & Glasgow, Ltd.	526
Jeavons, E. E., & Co., Ltd.	549
Keay, E. C. & J., Ltd.	552
Keith Blackman, Ltd.	552
King, Walter, Ltd.	549
Kings Patent Agency, Ltd.	550
Kirkham, Hulett, & Chandler, Ltd.	548
Kleenoff Co.	549
Lane, Francis	517
Lench, Thos. W., Ltd.	549
Main, R. & A., Ltd.	540
Menno Compressed Air Greasecup Co., Ltd.	520
Mewburn, Ellis, & Co.	550
Mitchell, H., & Co.	518
Newton Chambers & Co., Ltd.	534
Parkinson, W., & Co.	528
Peckett & Sons, Ltd.	520
Pulsometer Engineering Co., Ltd.	Cover IV
Radiation, Ltd.	538, 539
Reavell & Co., Ltd.	548
Ruscoe, John, & Co., Ltd.	520
Siebe, Gorman, & Co., Ltd.	548
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Thomas & Bishop, Ltd.	545
Trotter, Haines, & Corbett, Ltd.	549
Walker, C. & W., Ltd.	Cover I, 544
Waller, Geo. & Son, Ltd.	514
West's Gas Improvement Co., Ltd.	546
West's Piling and Construction Co., Ltd.	Cover IV
Woodall-Duckham Co., Ltd.	533

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GAS STOCKS AND SHARES

The general principle among investors nowadays being to "stay put," intending buyers, though few, have great difficulty in getting their orders fulfilled. Business during the past few weeks, therefore, has been on a very small scale, though prices generally have remained firm and the general undertone is one of confidence. British Government stocks continue to be the best feature and any changes in price either way have been fractional—2½% Consols being ¼ lower at 73¼ compared with a fortnight ago. The loan to the Southend Corporation gave a fillip to home Corporation stocks, but home rails remained quiet and dull. Some irregularity developed among industrials, though brick and cement shares hardened on an increased demand. Oil and rubber shares were still neglected, but towards the end of the week some support was forthcoming for Kaffir dividend-payers.

Business in the Gas Market last week was almost at a standstill, the only stocks to change hands being Bournemouth 7% at the top price of 110, several parcels of Commercial at prices ranging from 38½ to 40, Gas Light units at 13s. 9d. to 14s. 6d., South Metropolitan at 54½ to 57 and Wandsworth at 68. With one exception the changes in quotations were in a downward direction and compared with a fortnight ago Gas Light units have fallen 1s. to 14s., Southampton and Wandsworth 3 points each, while several preference and debenture stocks have also lost rather heavily. Enquiries for Tottenham 5% preference took the price up by no less than 13 points to 95½.

Except in the case of forced sales by trustees and others, investors in gas stocks are holding on to their securities since prices in many instances are now many points below the lowest reached in the last war and it will be remembered to what extent these appreciated soon afterwards. How far this process will be repeated after the present war it would be idle to predict, since circumstances are now very different and much depends upon an undertaking's immunity or otherwise from the ravages thereof.

Quotations on the London and Provincial Stock Exchanges

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Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 20.	Rise or Fall on Fortnight.
1,767,439	Sept. 16	7	7	Alliance & Dublin Ord. ...	102—112*	−3
374,000	July 1	4	4	Do. 4 p.c. Deb. ...	90—95	...
957,608	May 13	5	5	Assc'd. Gas & Water U'd'ts Ord.	12/—14/	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/6—17/6	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
336,646	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	12/—14/—	...
561,370	Aug. 12	7	7	Barnet Ord. 7 p.c.	100—105	−7½
300,000	Apl. 8	1/4½	1/9½	Bombay, Ltd.	19/6—21/6	...
690,407	Aug 19	7	7	Bournemouth 7 p.c. max. ...	100—110	...
362,025	June 17	4	4	Do. 4 p.c. Deb.	75—85	−12½
659,955	Aug. 19	6¾	4⅞	Brighton, &c., 5 p.c. Con. ...	68—73	...
855,000	Mar. 11	7	8	Brit. Gas Light Ord.	77—87	...
545,000	June 17	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	...
10,000	Nov. 6, '33	6	4	Cape Town, Ltd., 4½ p.c. Cu. Pf.	¼—¾	...
626,860	July 15	5⅞	6	Cardiff Con. Ord.	89—94	...
24,500	Apl. 8	7	7	Colombo Ord. 7 p.c. Pref ...	19/6—21/6	...
764,169	Mar. 26	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/6—16/6	..
400,000	,,	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	20/—22/—	...
1,748,935	July 22	2	3	Commercial Ord.	37—42	...
620,000	June 10	3	3	Do. 3 p.c. Deb.	58—63	...
286,344	Aug. 19	5	5	Do. 5 p.c. Deb.	88—93	..
807,560	Aug. 12	7	6	Croydon sliding scale	87—92	...
644,590	,,	5	5	Do. max. div.	90—85	...
620,385	July 1	5	5	Do. 5 p.c. Perp. Deb. ...	90—95	...
179,500	Aug. 19	5¼	5	East Surrey 'B,' 5 p.c.	75—80	...
176,461	June 17	5	5	Do. 5 p.c. Deb. (Irred.)...	90—95	...
250,000	July 8	4	6	Gas Consolidation Ord. 'B' ...	13/—15/—	...
250,000	May 13	4	4	Do. 4 p.c. Red. Cum. Pref.	15-/—17/—	...
19,152410	July 29	3½	4½	Gas Light & Coke Ord. ...	13/—15/-a	−1/—
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	54—59	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	72—77	...
2,993,000	July 8	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	78—83	...
8,602,497	June 3	3	3	Do. 3 p.c. Con. Deb. ...	65—70	...
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	99—104	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	98—103	...
700,000	Sept. 9	3½	3½	Do. 3½ Red. Deb. ...	80—85*	...
5,600,000	May 13	4	8	Imperial Continental Cap. ...	37—42	−1
43,820	July 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	63—68	...
231,978	Aug. 19	5	5	M.S. Utility 'C' Cons. ...	68—73	...
918,657	,,	4	4	4 p.c. Cons. Pref.	72—77	...
675,000	May 6	†4	†4	Montevideo, Ltd.	52—57	...
300,000	Apl. 29	9	7	Oriental, Ltd.	100—110	...
368,537	June 3	7	8	Plymouth & Stonehouse 5 p.c.	90—100	...
621,667	Aug. 19	8½	7½	Portsmouth & Gosport Cons.	97—102	...
648,999	,,	1/1	1/1½	Severn Val. Gas Cor. Ld. Ord.	13/6—15/6*	−/6
597,972	,,	-/10½	-/10⅝	Do. 4½ p.c. Cum. Pref. ...	15/6—17/6*	-/6
2,528,714	Sept. 2	1/—	-/7½	South East'n Gas Cn. Ld. Ord.	9/6—11/6*	...
1,000,000	,,	-/10½	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-*	...
1,068,869	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	13/—15/-*	...
6,709,895	Aug. 5	4	4	South Met. Ord.	53—58	...
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	98—108	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	70—75	...
1,895,445	July 1	3	3	Do. 3 p.c. Perp. Deb. ...	60—65	...
1,000,000	July 15	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
1,543,795	July 22	3	4	South Suburban Ord. 5 p.c. ...	60—70	...
512,825	July 8	5	5	Do. 5 p.c. Perp. Pref. ...	88—93	...
500,000	,,	4	4	Do. 4 p.c. Perp. Pref. ...	71—76	...
250,000	,,	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	80—85	...
888,587	June 10	5	5	Do. 5 p.c. Perp. Deb. ...	90—95	...
750,541	Aug 9	5½	5	Southampton Ord.	62—67	−3
350,000	Feb. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	90—95	...
1,076,495	Aug. 5	5	5	Tottenham & District Ord. ...	68—78	...
338,555	,,	5	5	Do. 5 p.c. Pref.	93—98	+13
453,380	June 10	4	4	Do. 4 p.c. Perp. Deb. ...	78—83	...
1,247,505	May 20	4	6	U. Kingdom Gas Cor. Ord. ...	12/—14/-	...
1,085,952	May 13	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	13/6—15/6	−/6
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum.Pref.	13/—15/-	−1/
745,263	June 17	4½	4½	Do. 4½ p.c. 2nd Non.Cum. Pf.	12/6—14/6	...
1,200,000	Sept. 9	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87*	−1
380,606	Aug. 5	7	6¾	Uxbridge, &c., 5 p.c.	80—90	...
1,371,138	July 8	3½	4	Wandsworth Consolidated ...	62—72	−3
2,525,768	,,	4	4	Do. 4 p.c. Pref.	60—70	−2½
1,343,964	June 17	5	5	Do. 5 p.c. Deb.	90—95	...
383,745	,,	4	4	Do. 4 p.c. Deb.	80—85	...
558,342	July 15	6	5	Watford & St. Albans Ord. ...	88—93	...
300,000	June 10	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 20.	Rise or Fall on Fortnight.
351,685	June 17	5	5	Brighton, &c., 5 p.c. Perp. Deb.	90—95	...
28,700	,, 17	5½	5½	Do. 5½ p.c. Red. Deb. 1942 ...	96—101	...
415,250	,, 17	4	4	Bristol Gas Co., 4 p.c. New Deb.	85—90	...
140,205	July 29	7	7	Cambridge, &c., 7 p.c. Cons. 'B'	100—110	...
295,932	Aug. 19	5	5	Cheltenham, 5 p.c. Cons. Ord....	88—93	...
42,500	July 1	4	4	Do. 4 p.c. Perp. Deb....	82—87	...
150,000	Aug. 12	4	4	Croydon Gas, 4 p.c. Pref. (Irr.)	70—75	...
130,000	July 1	4	4	Do. 4 p.c. Deb. ...	75—80	...
146,700	Aug. 19	5½	5½	East Surrey, 5½ p.c. Pref. 'A' ...	95—110	...
53,223	,, 19	6	6	Do. 6 p.c. Cum. Pref. ...	100—110	...
117,425	Feb. 5	8	8	East Wight, 5 p.c. Cons. Ord. ...	100—110	...
	Aug. 19	6	4	Eastbourne, 'B' 3½ p.c....	65—75	...
239,135	July 8	5	5	Gas Consolidation 'A' Ord. (£1)	13/6—15/6	...
156,600	Aug. 19	5	5	Hampton C't, 5 p.c. Cons. Ord.	68—73	...
18,000	June 10	7	7	Malta & Med'n., 7 p.c. 1st Pref.	60—65	...
10,845	,, 10	7½	7½	Do. 7½ p.c. 2nd Pref.	60—65	...
50,000	Aug. 19	£5 19 6	£5 4 6	Mid. South. Util., 'A' Cons. 5 p.c.	63—73	...
65,000	Aug. 12	5	5	North Middlesex, 5 p.c. Pref....	85—90	...
70,000	Sept. 9	5	5	Plymouth & Stone., 5 p.c. Deb.	87—92*	−3
76,501	July 1	4	4	Reading, 4 p.c. Perp. Deb. ...	75—80	...
74,777	April 1	4	4	Romford, 4 p.c. Debs. (Reg.) ...	85—90	...
21,000	June 10	5	5	Slough, 5 p.c. Perp. Deb. ...	90—95	...
211,740	,, 17	5	5	Southampton, 5 p.c. Red. Deb.	96—101	..
363,575	July 1	5	5	Tottenham, 5 p.c. Reg. Red. Mt.	95—100	...
202,019	Mch. 18	7½	6½	Tunbridge Wells, 4 p.c. Scale ...	70—80	...
135,257	June 10	5	5	Uxbridge &c., 5 p.c. Perp. Deb.	90—95	...

PROVINCIAL EXCHANGES

347,756	July 26	6	5	Bath Cons.	98—103	...
122,577	Feb. 19	7	7	Blyth 5 p.c. Ord.	109—111	...
1,667,250	July 15	5	5	Bristol, 5 p.c. max.	86—89	−3½
120,420	June 17	4	4	Do. 1st 4 p.c. Deb.	94—96	..
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	92—95	...
328,790	,,	5	5	Do. 5 p.c. Deb.	108—111	...
157,150	Aug. 5	6½	5	Chester 5 p.c. Ord.	98—101	..
92,500	June 17	4	4	Do. 4 p.c. Pref.	80—85	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	80—85	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	94—98	...
542,270	Feb. 12	6	9	Derby Cons.	103—108	...
55,000	June 10	4	4	Do. 4 p.c. Deb.	96—102	...
10,000	Aug. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord.	170—180	...
79,000	,,	10	10	Do. 'C' Ord.	160—170	...
732,000	Feb. 19	4	4	Hartlepool G. & W. Cn. & New	63—68	...
2,167,410	Aug. 19	6	6	Liverpool 5 p.c. Ord.	96—98	...
245,500	June 17	5	5	Do. 5 p.c. Red. Pref. ...	97½—100½	...
306,083	July 15	4	4	Do. 4 p.c. Deb.	99—101	...
20,000	June 24	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	June 24	5	5	Do. 5 p.c. Deb.	100—105	...
2,430,267	July 29	5⅞	5	Newcastle and Gateshead Con.	15 6—16/6a	...
682,856	,,	4	4	Do. 4 p.c. Pref.	73—75	...
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	80—85	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	97—102	...
274,000	July 26	5	5	Newport (Mon.) Ord.	89—93	...
13,200	Sept. 16	8½	7	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½*	−½
13,600	,,	6	5	Do. 7 p.c. 'B'	9½—10½*	−½
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½	...
106,280	Aug. 5	8	10	Preston 'A' 10 p.c.	157—167	...
188,219	,,	7	7	Do. 'B' 7 p.c.	113—123	...
1,806,339	Aug. 26	6½	6½	Sheffield Cons.	117½—120½	...
95,000	July 8	4	4	Do. 4 p.c. Deb.	97— 99	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	107—112	...
140,778	Aug. 12	5	5	Weston-super-Mare Cons. ...	87—90	...
64,338	June 24	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	137—145	...

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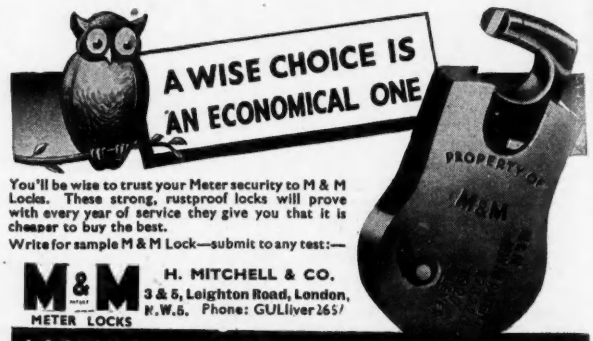

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